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PATENT SPECIFICATION



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COMPLETE SPECIFICATION.

Improvements in or relating to Rear Projection Screens.

Communication from TRANS-LUX DAY-LIGHT PICTURE SCREEN CORPORATION, a Corporation organised under the Laws of the State of Delaware, United States of America, of 247, Park Avenue, City and State of New York, United States of America.

5 I, ARTHUR HAROLD STEVENS, B.Sc. (Lond.), F.C.S., a Fellow of the Chartered Institute of Patent Agents, a Subject of the King of Great Britain, of the Firm of White, Langner, Stevens, Parry & Rollinson, 5—9, Quality Court, Chancery Lane, London, W.C. 2, Chartered Patent Agents, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

20 The invention relates to rear projection screens.

The invention relates to a rear projection screen formed from cellulose-acetate material having incorporated therein or associated therewith one or more agents which determine and/or vary the characteristics of the completed screen.

25 A rear projection screen should possess light transmission qualities of such nature that when an image is projected thereon from apparatus at the side opposite to that from which the image is to be viewed the projected beam of light will be diffused by the screen so as to obviate glare on the viewing side whilst rendering a visible image to the audience and/or so that little or no light, incident on the screen from the audience or viewing side, will be reflected back to the audience.

30 According to the invention there is provided a rear projection screen, comprising a sheet-like body having substantially its entire light-receiving surface formed from substantially homogeneous cellulose acetate material, an agent such, for example, as tri-phenyl phosphate incorporated in said body for imparting flexibility to the completed screen, and a light-diffusing means associated with or formed on said sheet-like body and being of such character as to impart to said body the light-transmission qualities defined above.

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teristics of the invention will become apparent from the following detailed description. 55

A screen constructed in accordance with the invention is disposed, usually substantially vertically between an audience and suitable projection mechanism from which emanates a beam of light passing to the eyes of an audience after traversing said screen. The aforesaid projection mechanism may be such, for example, as is coactable with suitable motion picture film bearing representations or pictures through which passes the aforesaid beam of light to affect the display of images of said representations or pictures on said screen. 60 65 70

A screen according to the invention may be prepared by bringing the cellulose-acetate material to viscous condition in association or combination with a solvent, an agent imparting flexibility to the completed screen, a light-diffusing agent and, if desired a light-filtering agent. 75

As stated above, the body of the screen is formed from or constituted by cellulose-acetate. This material may be of flaky character such, for example, as is readily obtained on the market. 80

The material utilized as a solvent may be of any suitable character. It has been demonstrated that acetone, ethyl lactate, and diacetone alcohol are satisfactory although other solvents may be substituted therefor. Preferably, the solvent includes a material or materials of low boiling point and another or others of high boiling point, the quantity of the low boiling point material, by preference, substantially exceeding that of the high boiling point material. In general, the quantity of the solvent substantially exceeds, ordinarily by many times, that of the base material. 85 90 95

To the end that the completed screen may be relatively flexible and not stiff or unyielding, an agent or material producing screen flexibility should be utilized. The material for this purpose may be, for example, triphenyl phosphate. Castor oil is also suitable; however, preferably it is not used with a solvent such as diacetone alcohol. 100 105

The light-diffusing agent has the property of causing the completed screen to properly and adequately diffuse the projected light. A variety of materials are suitable for this purpose such, for example, as zinc oxide, antimony oxide, barium sulfate, titanium oxide. Ordinarily, the light-diffusing agent should be used in an amount substantially less than the amount of the cellulose-acetate material.

In order to reproduce the color values of the field being projected with a satisfactory degree of faithfulness, it has been found desirable to provide a screen which is neutral or substantially so when acted upon by the light from the projecting light source; inasmuch as this light usually contains an excessive quantity of yellow rays, a filtering agent should be

employed. Without the filtering agent, white on the screen appears as a tan color, the other colors being affected in a corresponding manner. Obviously, the character of the source of light is largely controlling but, in general, only a small amount of the light-filtering agent is required in comparison with the amount of the cellulose-acetate material. Cobalt blue (inorganic) is satisfactory for this purpose. Similarly, the organic dyes, specifically Victoria blue base, erio-glaucine blue, oil soluble alizarin blue, may be utilized if desired.

Merely by way of one example of the invention and for purposes of explanation, a satisfactory screen composition formula is herewith stated qualitatively and quantitatively as follows:

| | | grams |
|----|------------------------|------------------------------|
| 40 | Base: | Cellulose-acetate - - - 30 |
| | Solvent: | Acetone - - - 240 |
| | | Ethyl lactate - - - 98 |
| | Flexible agent: | Triphenyl phosphate - - - 45 |
| | Light-diffusing agent: | Zinc oxide - - - 10 |
| 45 | Light-filtering agent: | Cobalt blue - - - 2 |

These materials may be mixed and brought to a homogeneous semi-fluid or viscous condition in any suitable manner. For example, all may be mixed together but a more preferable way involves separate treatment of some of the materials. To this end, the cellulose-acetate, the ethyl lactate and the acetone may be thoroughly mixed together and let set, or agitated, until the cellulose-acetate is thoroughly dissolved. Separately, it is desirable to mix some of the acetone with the triphenyl phosphate. The two solutions thus obtained may then be thoroughly mixed together, the zinc oxide and cobalt blue, meanwhile, being added.

The screen-forming operation may be initiated as soon as the cellulose-acetate and the triphenyl phosphate are thoroughly dissolved whereby the resulting mixture is a homogeneous viscous mass. In a preferred method, for producing the screen, a molding operation is utilized and this may be as follows:

A suitably dimensioned plate of metal, glass or the like is provided, the top surface of this plate being plane, smooth, etched or corrugated as desired. The plate is provided with a bordering wall of suitable height, as of the order of 1/32 of an inch, more or less, and the configuration of the space enclosed by this wall determines the initial configuration of the completed screen.

Thereupon, the aforesaid viscous material is poured into the spaced en-

closed by said bordering wall and the excess material suitably removed, as by a straight edge. The screen-forming material is now left alone for a substantial period of time, as for several hours, during which evaporation of the solvent occurs. After the solvent has substantially entirely evaporated, it will be found that the thickness of the remaining material is substantially less than the height of the aforesaid bordering wall. Further, such material has now become sheet-like and it may readily be removed from the plate used in the molding operation. After thus being removed, the aforesaid material inherently retains the sheet-like character, and, thereupon it may be suitably mounted and used as a screen. To thus mount the screen, a suitable binding may be cemented thereto and this may be laced or otherwise suitably secured in a supporting frame. If desired, evaporation of the solvents as described above may be accelerated by suitably elevating the temperature of the viscous material.

A screen constructed in accordance with the invention is very efficient for the purpose intended, particularly because it is flexible and may readily be rolled up. The images appearing thereon are sharp, definite and readily observable.

It shall be understood that the precise steps in the method hereinbefore described need not necessarily be followed, and that variations in the method may be prac-

tised to produce the screen. If desired the aforesaid viscous material may be rendered plastic and then moulded under pressure to produce a screen of the desired thickness and size. Then the sheet of moulded material may be finished by passing it through slightly heated rolls.

One way in which a screen according to the invention may be made is to work cellulose-acetate material, including an agent for imparting flexibility to the screen, into sheet-like configuration in any suitable manner, the light-diffusing agent thereafter being sprayed or painted thereon. A light-filtering agent may, in addition, be sprayed or painted on the screen should the use thereof be considered desirable.

The cellulose-acetate material, during the pressure moulding operation for producing the sheet-like configuration, may be roughened or corrugated on one or both surfaces or, if desired, the formed sheet of cellulose-acetate material may be mechanically treated, as by a sand-blasting operation, in order to impart the light transmission qualities hereinbefore defined.

Accordingly a product well known to the commercial world, by treatment in one manner or another, is made available for rear projection screen purposes. Primarily, the cellulose-acetate material is so conditioned by the light-diffusing means that the screen is substantially uniformly illuminated by the projecting source of light. In other words, the cellulose-acetate screen material is of such character that the "lens spot" screen effect is largely or substantially eliminated whereby the screen functions in a highly satisfactory and efficient manner.

The completed screen may be provided with one surface thereof dull in contradistinction to shininess and this dull surface should face the audience so as to avoid specular reflections being transmitted to the audience.

Under some circumstances, it may be desirable for the completed screen to include a suitable sheet of fabric, as one that is formed from strands, cross-wise or otherwise related so as to serve as an added light-diffusing means and also for reinforcing the screen. This fabric may

be a sheet of georgette silk or the like from which foreign matters such as gums, resins and the like have been suitably removed, the sheet preferably being stretched on a suitable open frame and then amalgamated with the viscous material on the aforesaid plate in the manner disclosed in Specification No. 368,723.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, (as communicated to me by my foreign correspondents), I declare that what I claim is:—

1. A rear projection screen, comprising a sheet-like body having substantially its entire light-receiving surface formed from substantially homogeneous cellulose-acetate material, an agent, such for example, as triphenyl phosphate incorporated in said body for imparting flexibility to the completed screen, and a light-diffusing means associated with or formed on said sheet-like body and being of such character as to impart to said body the light-transmission qualities hereinbefore defined.

2. A rear projection screen, according to claim 1, in which the light-diffusing means is an agent such as zinc oxide which is uniformly incorporated in the cellulose acetate material.

3. A rear projection screen, according to claim 1, in which a sheet of fabric is intimately associated with the sheet-like body and serves as an added light-diffusing means and also as a reinforcement for the completed screen.

4. A rear projection screen according to claim 1, 2 or 3 in which a light-filtering agent is incorporated in said body.

5. A rear projection screen substantially as hereinbefore described.

Dated the 14th day of March, 1932.
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Reference has been directed, in pursuance of Section 7, Sub-section 4, of the Patents and Designs Acts, 1907 to 1932, to Specifications Nos. 141,669 and 139,815.

